Zoosyst. Evol. 101 (4) 2025, 1423–1443 | DOI 10.3897/zse.101.153299

Synapseudes marinae (Tanaidacea, Apseudomorpha, Metapseudidae) the first metapseudid species from the Sea of Crete, and redescription of *S. mediterraneus* from Israel

Maxim-J. Bâlcu[1,2], Rozalia M. Motoc[1], Andrei Ștefan[1], Dumitru Murariu[3], Oana P. Popa[1]

1 *"Grigore Antipa" National Museum of Natural History, 1 Kiseleff Blvd, 011341 Bucharest, Romania*
2 *Doctoral School of Biology, Faculty of Biology, University of Bucharest, Splaiul Independenței 91–95, 050095 Bucharest, Romania*
3 *Romanian Academy, Calea Victoriei 125, 010071 Bucharest, Romania*

https://zoobank.org/716115E4-4B19-4300-852F-760561131A94

Corresponding author: Oana P. Popa (oppopa@antipa.ro)

Academic editor: Luiz F. Andrade ♦ **Received** 19 March 2025 ♦ **Accepted** 4 July 2025 ♦ **Published** 8 August 2025

Abstract

We present the morphological and genetic characterization of a new shallow-water tanaid, *Synapseudes marinae* **sp. nov.**, collected from Milatos Beach on the northern coast of Crete, marking the first record of the genus *Synapseudes* from the Sea of Crete. This species exhibits strong morphological similarities to *Synapseudes mediterraneus*, briefly described by Băcescu in 1977 from the Mediterranean waters of Israel, which is also redescribed herein. In addition to the taxonomic descriptions, we include mitochondrial cytochrome c oxidase subunit I (COI) data to support the classification of the newly described species within the *Synapseudes* genus, noting a p-distance value of 28% between species of *Synapseudes*. A detailed diagnosis of the *Synapseudes* species occurring in the Mediterranean Sea is provided. Scanning electron microscopy images of *S. marinae* **sp. nov.** have been incorporated to enhance the optical microscope drawings and provide a more comprehensive depiction of this new species.

Key Words

Crustacean, Mediterranean Sea, morphology, molecular analysis, SEM images, shallow waters, taxonomy

Introduction

The Mediterranean Sea is a large enclosed body of water, crossed by numerous shipping lanes of intense marine traffic, and its coasts are home to high-density human settlements. This raises challenges such as pollution, the spread of invasive species, and habitat loss. Assessing its biodiversity is essential for effective resource management and conservation planning. In 2010, an estimated 17,000 marine species were present in the Mediterranean, making it a biodiversity hotspot; however, thorough ecological and taxonomic studies have been conducted mostly in the western Mediterranean (Coll et al. 2010).

Tanaidacea Dana, 1849 (Crustacea, Malacostraca) are members of the Peracarida superorder, living almost exclusively in marine and brackish-water habitats, and have a worldwide distribution (Segadilha and Araújo-Silva 2024). Tanaids usually have a benthic lifestyle; they can be found burrowing or free-living at depths ranging from the intertidal zone to oceanic trenches (Holdich and Jones 1983; Gouillieux et al. 2023), and they often represent an important fraction of the macrofaunal assemblages in coastal ecosystems. Both the western and eastern Mediterranean basins have been covered by recent taxonomic and ecological studies on tanaid fauna, including the description of new species, which took place in France (Gouillieux et al. 2023), Tunisia (Esquete et al. 2019), and Cyprus (Stępień et al. 2024), while Lubinevsky et al. (2022) carried out a comprehensive revision of the entire order along the Israeli coast, and Bakalem et al. (2021) focused on the inventory and distribution of peracarids along the Algerian shores.

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While the Mediterranean Sea checklist reports 69 tanaid species, including *Synapseudes mediterraneus* Băcescu, 1977, from the Metapseudidae family, only 20 tanaid species are found in Greek waters (Koulouri et al. 2020). These belong to five families: Apseudidae, Leptocheliidae, Leptognathiidae, Parapseudidae, and Tanaididae, with no record of the genus *Synapseudes* Miller, 1940. This discrepancy points to a superficial representation of tanaid fauna studies in Greece, possibly due to a lack of taxonomists in the region, on the one hand, and difficulties in collecting and identifying the material, on the other hand.

The northeastern Mediterranean Basin, with its dynamic geomorphologic features, seafloor topography, and numerous islands (Gönülal and Dalyan 2017), offers a great diversity of habitats, such as rocky shores, shallow coastal waters, corals, stony bottoms, and varied vegetation that are populated exclusively by tanaidaceans belonging to the suborder Apseudomorpha, families Apseudidae, Metapseudidae, Leptocheliidae, etc. (Guțu 2001).

So far, three species of *Synapseudes* have been documented in the Mediterranean Sea: *S. shiinoi* Riggio, 1973, from the Bay of Palermo, northwest Sicily, along the rocky shores of Mount Pellegrino; *S. mediterraneus* Băcescu, 1977, from the waters of Israel; and *S. cystoseirae* Amar & Cazaubon, 1978, from the Le Brusque region in the Var department, as well as the Frioul Archipelago in the Gulf of Marseille, France (Băcescu 1977; Riggio 1977; Amar and Cazaubon 1978).

For *S. mediterraneus*, Băcescu (1977) briefly describes a female: body, rostrum, pleon, pleotelson, antennule, antenna, labrum, mandibles, maxilliped, pereopods 1–6, and uropod. For the male, he provides only data regarding sexual dimorphism, including the chela, pleotelson, antennule setation, and genital tubercle, and designates a male as holotype.

In this study, the description of a new species of *Synapseudes* from the shallow waters of Milatos Beach, along the northern coast of Crete, is provided, with both a morphological and genetic characterization. This is the first recorded occurrence of the genus from the Sea of Crete and the fourth species of *Synapseudes* recorded in the Mediterranean Sea. Because the new *Synapseudes* species shares some similarities with *S. mediterraneus*, which was briefly described by Băcescu, we considered it important and appropriate, from a morphological and taxonomic point of view, to redescribe it, thus resolving certain ambiguities and inadvertencies. Additionally, a detailed redescription of the non-ovigerous female, the male cheliped, and some remarks about juveniles and manca II of *S. mediterraneus* are provided.

The discovery of this new species contributes to the enrichment of the crustacean fauna of the Sea of Crete and encourages future faunistic research, so highly needed.

Materials and methods

The specimens of the newly described tanaidacean species were collected in October 2023 and June 2024 on the northeastern and southeastern shores of Crete (Fig. 1) by

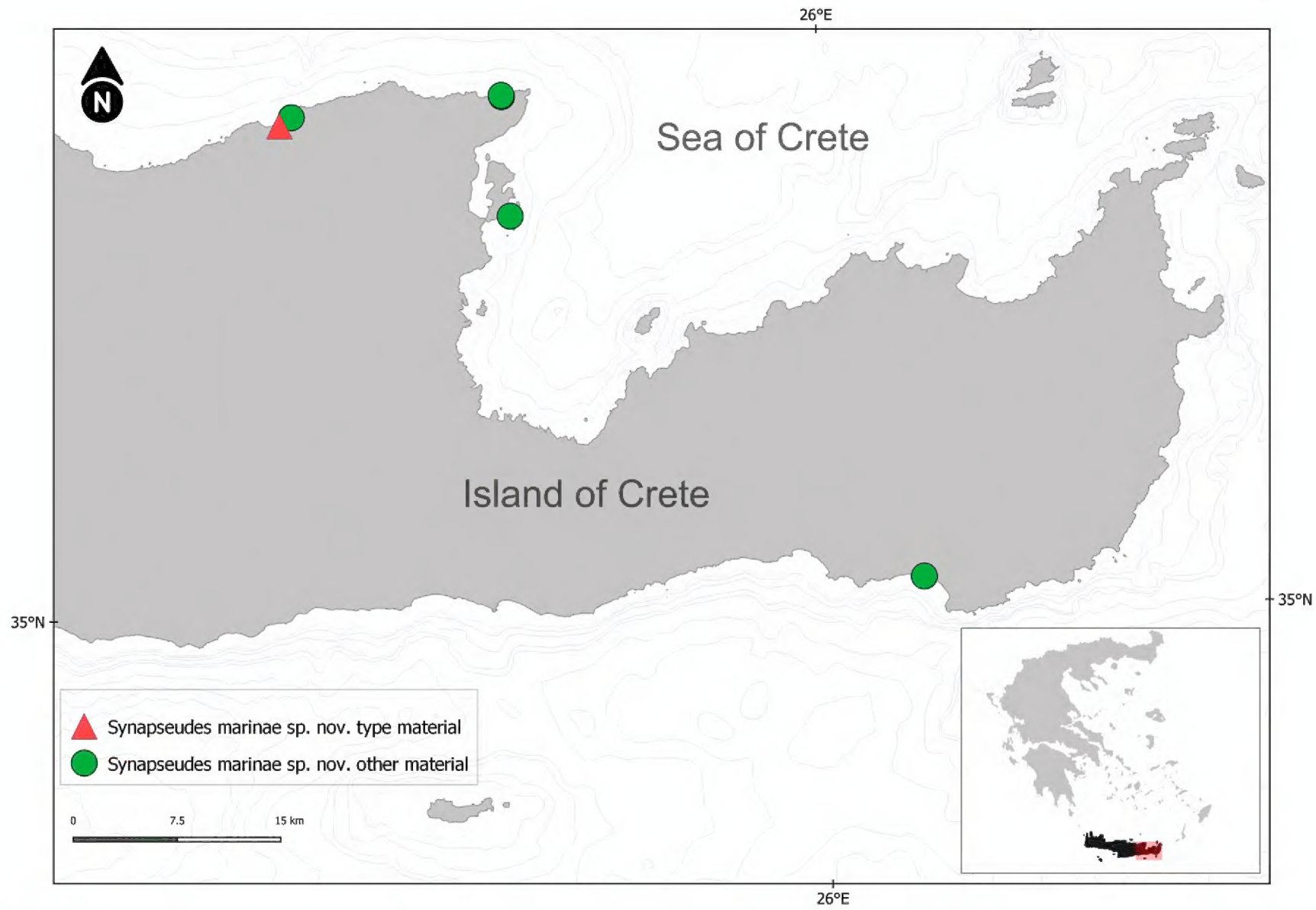

Figure 1. Map showing the sampling sites for the type material (triangle shape) and other material (circle shape) of *Synapseudes marinae* sp. nov.; in overview, the Island of Crete with marked sampling area.

scraping the rocky substrate down to a depth of 0.5 m using a 10 × 15 cm hand-held dredge equipped with a plankton net. The content of the net (including algae and sediment) was drained, placed in 96% ethanol, and stored at 4 °C. Initial sorting of specimens was performed in the laboratory by eye and under a CARL ZEISS SM-XX CMO Citoplast stereomicroscope. The specimens used for morphology were transferred and kept in 70% ethanol. All examined material is deposited in the collections of the "Grigore Antipa" National Museum of Natural History, Bucharest. Dissections were performed under a CARL ZEISS SM-XX CMO Citoplast stereomicroscope. Appendages were mounted on temporary or permanent slides (in Euparal) and observed with an Olympus CX21 microscope; drawings were made using a camera lucida attached to the microscope. Figures were prepared by scanning the plates.

The morphological terminology primarily follows that proposed by Larsen (2003), Heard et al. (2018), and Bâlcu and Murariu (2024).

Three females and one manca were dehydrated through a graded ethanol series and dried using hexamethyldisilazane (HMDS) (Nation 1983). The samples were mounted on aluminum stubs covered with conductive double-sided adhesive carbon tabs and then sputter-coated (SEM Coating Unit E5100). The specimens were analyzed and photographed using a Phenom Pro desktop scanning electron microscope (SEM) (Thermo Fisher Scientific, The Netherlands) at 10 kV acceleration voltage.

Genomic DNA was extracted from one specimen of *Synapseudes* sp. nov. (♀, which was destroyed during the DNA isolation procedure) using the QIAamp® DNA Mini Kit, following the manufacturer's specifications. A partial fragment of the mitochondrial cytochrome c oxidase subunit I gene (COI) was amplified using the universal PCR primers LCO1490 and HCO2198 (Folmer et al. 1994).

The thermocycling profile for COI amplification consisted of an initial denaturation step of 2 min at 95 °C, followed by 5 cycles of 30 s at 95 °C, 90 s at 45 °C, and 60 s at 72 °C; 35 cycles of 30 s at 95 °C, 90 s at 52 °C, and 60 s at 72 °C; and a final elongation step of 5 min at 72 °C. The PCR reactions were performed in a total volume of 50 µL containing 5 ng of DNA template, 1× Green GoTaq® Flexi Buffer, 2.5 mM $MgCl_2$, 0.1 mM each dNTP, 0.5 µM of each primer, and 1.5 units of GoTaq® DNA polymerase (Promega, Madison, WI, USA).

The PCR products were isolated from samples presenting clean and visible bands on ethidium bromide-stained 1.5% (w/v) agarose gel using the Geneaid Gel/PCR Purification Kit (Geneaid Biotech Ltd., Taiwan), following the manufacturer's specifications. DNA sequencing was performed by Macrogen (Amsterdam, The Netherlands). The sequences were edited and aligned in CodonCode Aligner v. 3.7.1 (CodonCode Corporation, Dedham, MA, USA).

We included 37 COI sequences from the suborder Apseudomorpha, along with representatives from two families within Tanaidomorpha and two *Cumacea* species (used as outgroups), obtained from GenBank and BOLD Systems (Table 1). To assess the phylogenetic relationships between *Synapseudes* sp. nov. and related species, we conducted a Bayesian inference analysis in BEAST v1.8.0 (Drummond et al. 2012).

The best-fit nucleotide substitution model was determined using MEGA X (Kumar et al. 2018) under the Bayesian Information Criterion (BIC). Consensus trees were generated and annotated with Bayesian posterior probabilities (PP) using TreeAnnotator and visualized in FigTree v.1.4.4 (Rambaut 2018). Additionally, genetic p-distances within and between different *Synapseudes* species were calculated using MEGA X.

The map was created using QGIS 3.28 (QGIS Development Team 2022).

Table 1. Information on sequences used in molecular analyses.

	Acc. No.	Species	Taxonomy	Specimens Depositories
1.	HM016216	*Apseudes intermedius/ bermudes*	Suborder Apseudomorpha Fam. Apseudidae	Drumm 2010
2.	HM016200	*Hoplomachus propinquus*	Suborder Apseudomorpha Fam. Apseudidae	Drumm 2010
3.	JBMFE014-22	*Apseudes novaezealandiae*	Suborder Apseudomorpha Fam. Apseudidae	National Institute of Water and Atmospheric Research, Wellington BOLD Systems
4.	PMACA078-17	*Apseudopsis latreillii*	Suborder Apseudomorpha Fam. Apseudidae	University of Aveiro, Centre for Environmental and Marine Studies BOLD Systems
5.	PMACA079-17	*Apseudopsis latreillii*	Suborder Apseudomorpha Fam. Apseudidae	University of Aveiro, Centre for Environmental and Marine Studies BOLD Systems
6.	PMACA080-17	*Apseudopsis latreillii*	Suborder Apseudomorpha Fam. Apseudidae	University of Aveiro, Centre for Environmental and Marine Studies BOLD Systems
7.	SWEMA601-15	*Apseudes spinosus*	Suborder Apseudomorpha Fam. Apseudidae	Göteborg Natural History Museum BOLD Systems
8.	SWEMA602-15	*Apseudes spinosus*	Suborder Apseudomorpha Fam. Apseudidae	Göteborg Natural History Museum BOLD Systems

	Acc. No.	Species	Taxonomy	Specimens Depositories
9.	KANBI227_19	Apseudomorpha	Suborder Apseudomorpha Fam. Metapseudidae	University of Florida BOLD Systems
10.	KANBI1080_19	Apseudomorpha	Suborder Apseudomorpha Fam. Metapseudidae	University of Florida BOLD Systems
11.	HM016207 GBCM15564_19	*Synapseudes*_sp_DD2010	Suborder Apseudomorpha Fam. Metapseudidae	Drumm 2010
12.	GBCM15566_19 HM016208	*Pseudoapseudomorpha*_ DD2010	Suborder Apseudomorpha Fam. Metapseudidae	Drumm 2010
13.	OQ417186 GBCAB39636_24	*Synapseudes* sp. M5.Lb-40-Sdp	Suborder Apseudomorpha Fam. Metapseudidae	Unpublished
14.	KP225292	*Calozodium pabisi*	Suborder Apseudomorpha Fam. Metapseudidae	Jakiel et al. 2015
15.	KP225293	*Calozodium pabisi*	Suborder Apseudomorpha Fam. Metapseudidae	Jakiel et al. 2015
16.	HM016217 GBA5243-10	*Parapseudes* sp.	Suborder Apseudomorpha Fam. Parapseudidae	Drumm 2010
17.	GBCAB28527-24 OR388838	*Parapseudidae*	Suborder Apseudomorpha Fam. Parapseudidae	BOLD Systems
18.	HM016210	*Monokalliapseudes schubartii*	Suborder Apseudomorpha Fam. Kalliapseudidae	Drumm 2010
19.	GBA5176-10 HM016211	*Alokalliapseudes macsweenyi*	Suborder Apseudomorpha Fam. Kalliapseudidae	Drumm 2010
20.	GBA5174-10 HM016213	*Alokalliapseudes macsweenyi*	Suborder Apseudomorpha Fam. Kalliapseudidae	Drumm 2010
21.	GBA5175-10 HM016212	*Alokalliapseudes macsweenyi*	Suborder Apseudomorpha Fam. Kalliapseudidae	Drumm 2010
22.	GBCM15565-19 HM016209	*Psammokalliapseudes granulosus*	Suborder Apseudomorpha Fam. Kalliapseudidae	Drumm 2010
23.	JF962424 GBCM628-12	*Alokalliapseudes macsweenyi*	Suborder Apseudomorpha Fam. Kalliapseudidae	Drumm and Heard 2011
24.	JF962425 GBCM629-12	*Alokalliapseudes macsweenyi*	Suborder Apseudomorpha Fam. Kalliapseudidae	Drumm and Heard 2011
25.	GBCAB39750-24 OQ417206	*Mesokalliapseudes*	Suborder Apseudomorpha Fam. Kalliapseudidae	Mined from GenBank, NCBI
26.	GBCAB40313-24 OQ417182	*Mesokalliapseudes*	Suborder Apseudomorpha Fam. Kalliapseudidae	Mined from GenBank, NCBI
27.	HM016204	*Tanais dulongii*	Suborder Tanaidomorpha Fam. Tanaidae	Drumm 2010
28.	HM016203	*Zeuxo normani*	Suborder Tanaidomorpha Fam. Tanaidae	Drumm 2010
29.	HM016215	*Leptochelia dubia*	Suborder Tanaidomorpha Fam. Leptocheliidae	Drumm 2010
30.	HM016214	*Hargeria rapax*	Suborder Tanaidomorpha Fam. Leptocheliidae	Drumm 2010
31.	HM016206	*Leptochelia forresti*	Suborder Tanaidomorpha Fam. Leptocheliidae	Drumm 2010
32.	HM016201	*Leptochelia longichelipedes*	Suborder Tanaidomorpha Fam. Leptocheliidae	Drumm 2010
33.	HM016202	*Pseudoleptochelia* sp.	Suborder Tanaidomorpha Fam. Leptocheliidae	Drumm 2010
34.	HM016205	*Paratanais* sp.	Suborder Tanaidomorpha Fam. Paratanaidae	Drumm 2010
35.	AF352298	*Diastylis crenellate*	Outgroup: Cumacea	Drumm 2010
36.	AF137512	*Oxyrostylis smithi*	Outgroup: Cumacea	Drumm 2010
37.	PV748674	*Synapseudes* sp. nov.	Suborder Apseudomorpha Fam. Metapseudidae	Present study

Results

Taxonomy

Order Tanaidacea Dana, 1849
Suborder Apseudomorpha Sieg, 1980
Superfamily Apseudoidea Leach, 1814
Family Metapseudidae Lang, 1970
Subfamily Synapseudinae Guțu, 1972
Genus *Synapseudes* Miller, 1940

***Synapseudes mediterraneus* Băcescu, 1977**
Figs 2–4, Table 2

Material examined. ***Holotype*** • 1 male, length 1.7 mm (No. 49211/372). ***Allotype*** • 1 female with empty marsupium (No. TAN 054/373). ***Paratypes*** • 10 males (No. TAN 056/373b) and 7 adult females (No. TAN 055/373b), from which 1 non-ovigerous female was dissected (permanent slide). ***Non-types*** • 5 juveniles (No. TAN 057), from Mediterranean waters of Israel, Bat Yam, 3 km south of Tel Aviv, station TM 15, depth 1 m, 1 November 1976, on a subtidal sandstone platform, in algae *Jania* sp., leg. Prof. Lev Fishelson.

Other material. (determined by Maxim-Jean Bâlcu in the museum's scientific crustacean collection) • 1 adult female, 1 male, and 1 manca II, Station T 80-31, Israel, without other collection data (from Prof. Dr. Mihai Băcescu Collection).

Revised diagnosis. Adult body length: females 1.3–1.9 mm, males 1.5–1.8 mm. Rostrum short, wide, anterior margin slightly concave and rugose. Pereonites 1–6 with one simple seta on each anterolateral corner; pereonites 4–6 with one simple seta on each posterolateral corner. Pereonites 2 and 3 longest. Each pereonite much wider than long, laterally rounded. Pleonite 1 slightly longer and wider than second. Pleotelson with about six dorsal simple setae, three posterolateral simple setae on each side, two caudo-dorsal simple setae on apex. Antennule peduncle with four articles, articles 2–4 wider than long; first article longer than following ones combined, inner margin with six sharp small denticles. Inner flagellum with two articles; second article with three simple setae, one aesthetasc terminally. Outer flagellum with three articles; second article with one aesthetasc, two simple setae; last article with four long simple setae, terminally. Antenna peduncle with four articles; flagellum uniarticulate, small, with four long simple setae terminally. Maxilliped first palp article with one small simple seta on inner side, one long thick seta on outer distal corner; article 2 largest, with eight stout and two long simple setae on inner margin, distally; one long thick seta on outer distal corner. Pereopod 1 basis with two or three dorsal apophyses; pereopod 2 basis with one, two, or rarely three dorsal apophyses; pereopod 3 basis with one dorsal apophysis. Pereopods 1–3 propodus with four ventral spines. Pereopods 4–5 carpus with four ventral spines; pereopod 6 carpus with three ventral spines. Pereopods 4–6 propodus with two small ventral spines.

Redescription of non-ovigerous female (dissected paratype). ***Body*** (Fig. 2A) short, thick, relatively cylindrical, approximately 4.5 times as long as wide; length about 1.3 mm.

Cephalothorax (Fig. 2A) (including rostrum) approximately 28% of body length, about 1.4 times as long as wide. Rostrum short, wide, anterior margin slightly concave and rugose. Ocular lobes undefined; visual elements with dark pigment. One very small, simple seta under eyes. Two medial simple setae on both sides of carapace.

Pereon (Fig. 2A) approximately 59% of body length, about 2.1 times as long as carapace length; each pereonite much wider than long, laterally rounded. Pereonites 2 and 3 longest, each 0.5 times as long as wide. All pereonites with one simple seta on each anterolateral corner; pereonites 4–6 with one simple seta on each posterolateral corner. Pereonite 1 with two pairs of mid-dorsal simple setae; pereonites 2, 3, and 6 with three pairs of dorsal simple setae; pereonites 4 and 5 with four pairs of dorsal simple setae.

Pleon (Fig. 2A) approximately 13% of body length, composed of two free pleonites and pleotelson. First pleonite slightly longer and wider than second. Each pleonite with four mid-dorsal simple setae and one lateral seta (latter appears to be plumose seta, as in Băcescu 1977; see fig. 2D). Each pleonite expanded posterolaterally by small spiniform process.

Pleotelson (Fig. 2A) about 1.6 times as long as combined pleonites, triangular; apex acute in dorsal view, crest-like in lateral view; with about six unequal dorsal simple setae, three posterolateral simple setae on each side, two caudo-dorsal simple setae on apex.

Antennule (Fig. 2B). Peduncle with four articles; first article longer than following ones combined, about 1.7 times as long as wide; inner margin with six sharp small denticles and one small simple seta on dentiform prolongation; outer margin with four penicillate and four simple setae; three simple and two penicillate setae on dorsal surface. Articles 2–4 wider than long. Article 2 narrow, 0.3 times as long as article 1, with two simple setae on inner and three simple setae on outer margin, distally; five penicillate setae subterminally. Article 3 much narrower, 0.6 times as long as article 2, with two simple setae on inner and one simple seta on outer margin, distally. Article 4 (common) 0.7 times as long as article 3, with two simple setae inner distally, small notch for insertion of outer flagellum. Inner flagellum with two articles; first article with one inner small simple seta; second article about equal in length to first, with two long thick simple setae, one small simple seta, one aesthetasc terminally. Outer flagellum slightly longer than inner, with three articles; first article with one outer simple seta; second with one aesthetasc and two simple setae on inner distal corner; third article with four long simple setae, terminally.

Antenna (Fig. 2C) (without terminal setae) smaller than first peduncular article of antennule. Peduncle with four articles. First article with inner dentiform expansion, naked. Articles 2 and 3 wider than long. Article 2 about 0.6 times as long as article 1, with one small simple seta on outer dis-

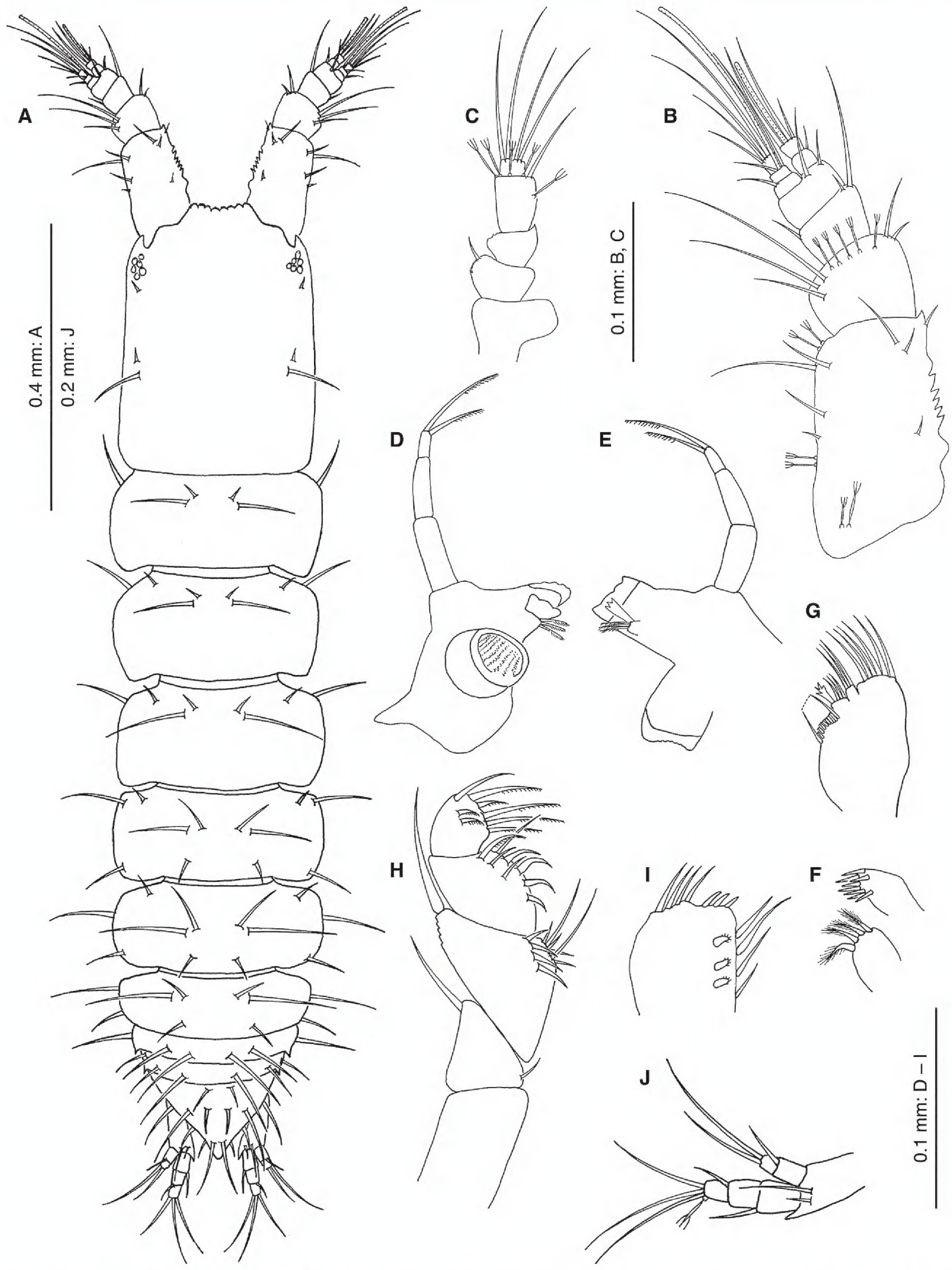

Figure 2. *Synapseudes mediterraneus*, paratype, non-ovigerous female: **A.** Body, dorsally; **B.** Antennule; **C.** Antenna; **D.** Left mandible; **E.** Right mandible; **F.** Maxillule, outer and inner endite; **G.** Maxilla; **H.** Maxilliped; **I.** Maxilliped endite; **J.** Uropod.

tal corner. Article 3 shortest, about 0.9 times as long as article 2, naked. Article 4 longer than articles 2 or 3, with one inner penicillate seta, about four penicillate setae and one long simple seta, distally. Flagellum uniarticulate, small, with four long simple setae, terminally. Squama absent.

Labrum (unfigured) with conical projection.

Mandibles (Figs 2D, E) with three-articled palp; article 1 about 2.6 times as long as wide, naked; article 2 about 2.5 times as long as wide, naked; article 3 smallest, with two unequal setulated setae, terminally. Pars molaris without special features. Pars incisiva of left mandible (Fig. 2D) wide, lacking conspicuous denticles; lacinia mobilis with three rounded denticles; setiferous lobe with three serrated setae. Pars incisiva of right mandible (Fig. 2E) wide, lacking conspicuous denticles; setiferous lobe with three serrated setae and one stout furcate seta.

Labium unstudied.

Maxillule palp broken and lost. Outer endite (Fig. 2F) with about eight narrow spines terminally; inner endite with four setulate setae, terminally.

Maxilla (Fig. 2G) with outer lobe of movable endite with six long simple setae distally. Inner lobe of movable endite with about three simple setae. Outer lobe of fixed endite with three setae and one stout furcate seta. Inner lobe of fixed endite with row of 10 setae (thicker at the base), distally.

Maxilliped (Fig. 2H) with basis about 1.4 times as long as wide, naked. First palp article short and broad, with one small simple seta on inner side and one long and thick seta on outer distal corner. Article 2 largest, narrower proximally, with eight stout simple setae in two rows and two long simple setae on inner margin, distally; one long thick seta on outer denticled distal corner. Article 3 smaller than article 2, with three unequal simple setae, one finely serrated seta and four stout curved setae on inner margin. Article 4 smallest, with two small finely serrated setae, subterminally, five serrated setae and one simple seta on inner side. Endite (Fig. 2I) with four simple and three truncate thick setae on rostral side; inner margin with four setae and three coupling hooks.

Epignath unstudied.

Cheliped (Fig. 3A). Basis 1.3 times as long as wide, broad; rounded ventrally; with one mid-ventral and one disto-ventral simple seta. Exopod absent. Merus subtriangular; 3.7 times as long as wide; extended ventrally about half length of carpal margin; with one small proximal and two long distal simple setae, ventrally. Carpus approximately two times as long as wide; with two distal simple setae, ventrally; one distal simple seta, dorsally. Propodus as long as carpus; palm with one long and one small simple seta on outer face; one long simple seta and two small serrated setae near dactylus joint on inner face; fixed finger thick; outer face with eight simple setae (two ventral, six submarginal in distal third of fixed finger); cutting edge with about four sharp denticles. Claw small; orange-brown colour. Dactylus as wide as fixed finger; three thick inner simple setae near claw; claw stout; orange-brown colour; stronger than that of fixed finger; weakly bidentate tip.

Pereopod 1 (Fig. 4A) largest. Exopod absent. Basis 2.8 times as long as wide; ventral margin with one proximal and two distal small simple setae; two proximal small simple setae and two distal apophyses dorsally. Ischium very short; 0.2 times as long as wide; with one ventral simple seta. Merus 1.2 times as long as wide; three simple setae and one distal spine ventrally; one simple seta and one distal spine dorsally. Carpus shorter than merus; about as long as wide; with two spines and one simple seta ventrally; two outer subdistal spines; one distal robust spine and one long simple seta dorsally. Propodus 1.9 times as long as wide; with four ventral spines (increasing in size distally); two outer subdistal spines; one penicillate seta, one robust spine and one simple seta dorsally; one small subdistal inner serrated seta near dactylus articulation. Dactylus with two small ventral setae; unguis short and curved.

Pereopod 2 (Fig. 4B). Basis 2.5 times as long as wide; ventral margin with two distal small simple setae; one small simple seta and two apophyses mid-dorsally. Ischium very short; 0.2 times as long as wide; with one ventral simple seta. Merus 1.2 times as long as wide; with one long and three small simple setae ventrally; one outer subdistal simple seta; one distal spine dorsally. Carpus shorter than merus; wider than long; with one small simple seta and two spines ventrally; two outer subdistal spines; two outer long simple setae; one distal spine dorsally. Propodus 1.6 times as long as wide; with four ventral spines (increasing in size distally); two outer subdistal spines; one penicillate seta, one robust distal spine and one simple seta dorsally; one small subdistal inner serrated seta near dactylus articulation. Dactylus and unguis as in pereopod 1, but shorter.

Pereopod 3 (Fig. 4C) smaller than pereopod 2. Basis three times as long as wide; ventral margin with one proximal and two distal small simple setae; one small simple seta and one small apophysis mid-dorsally. Ischium very short; 0.2 times as long as wide; with one ventral simple seta. Merus 1.3 times as long as wide; with three simple setae ventrally; one distal simple seta and one distal slender spine dorsally. Carpus shorter than merus; wider than long; with two ventral spines; two mid-outer spines; one subdistal spine and two subdistal simple setae dorsally. Propodus 2.3 times as long as wide; with four ventral spines (increasing in size distally); two outer subdistal spines; one penicillate seta, one distal robust spine and one distal long simple seta dorsally; one small subdistal inner serrated seta near dactylus articulation. Dactylus and unguis similar to those of pereopod 2, but smaller.

Pereopod 4 (Fig. 4D). Basis about 2.2 times as long as wide; with one small distal seta ventrally; two small (one proximal, one mid) simple setae dorsally. Ischium very short; 0.3 times as long as wide; with one ventral simple seta. Merus 1.3 times as long as wide; with two simple setae and one subdistal small spine ventrally; one slender spine dorsally. Carpus as long as merus; with one small simple seta and four spines ventrally; one outer subdistal spine and one outer simple seta; one spine and two simple setae dorsally. Propodus two times as long as wide; with two small (one mid, one subdistal) spines ventrally; one penicillate seta and four serrated setae dorsally. Dactylus and unguis similar to those of pereopod 3, but larger.

Pereopod 5 (Fig. 4E). Basis about 2.5 times as long as wide; with three small (two proximal, one distal) simple setae ventrally. Ischium short; 0.4 times as long as wide; with one ventral simple seta. Merus 1.5 times as long as wide; with three simple setae ventrally; one distal slender spine dorsally. Carpus shorter than merus; wider than long; with one simple seta and four spines ventrally; one distal spine and two unequal simple setae dorsally. Propodus three times as long as wide; with two small (one mid, one subdistal) spines ventrally; one outer simple seta subdistally; one penicillate and one subdistal serrated seta dorsally. Dactylus and unguis similar to those of pereopod 4, but thinner and longer.

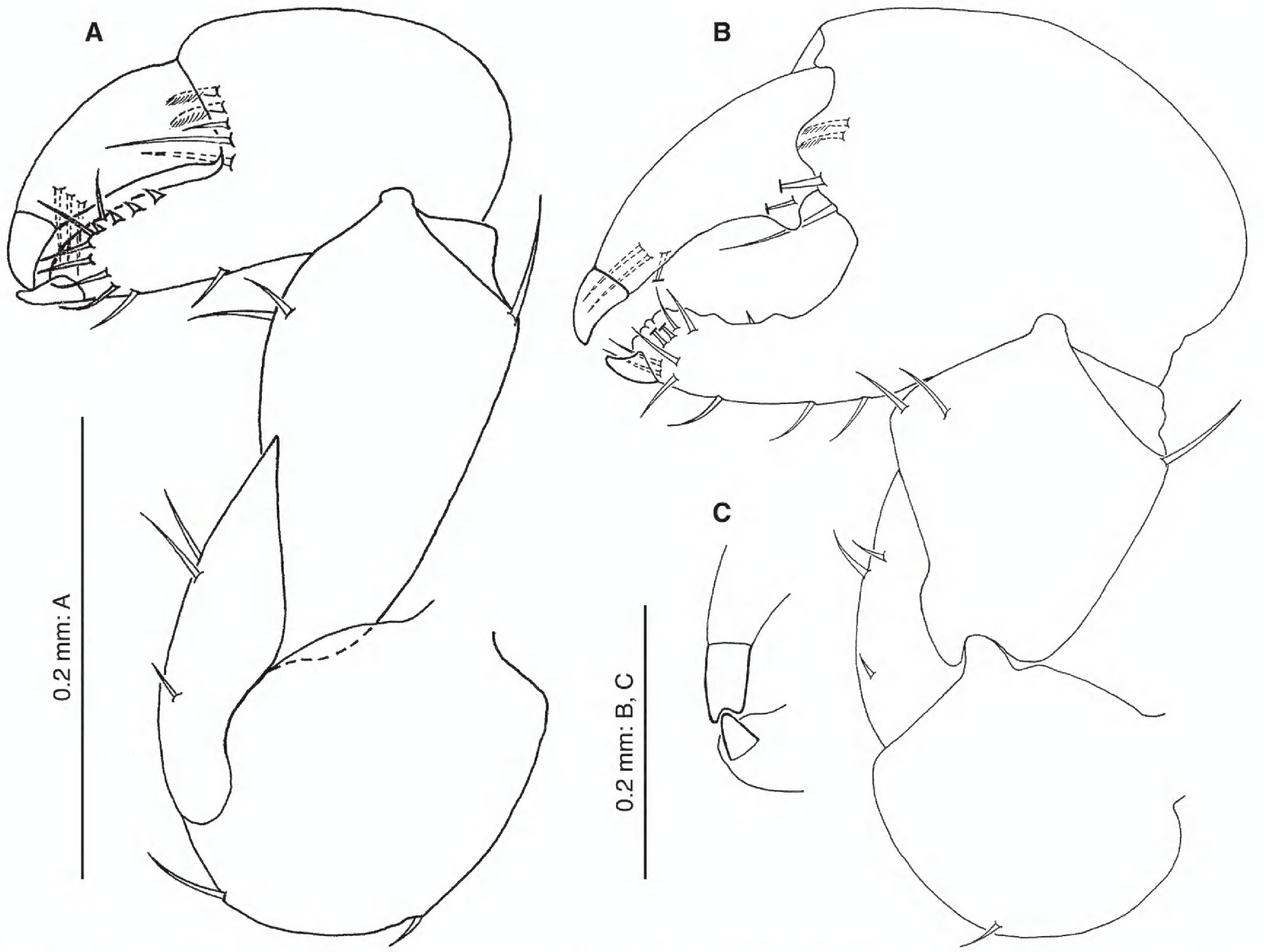

Figure 3. *Synapseudes mediterraneus*, paratypes: **A.** Non-ovigerous female cheliped, outer view; **B.** Male cheliped, outer view; **C.** Fixed finger claw and dactylus bidentate claw, detail of male cheliped.

Pereopod 6 (Fig. 4F). Basis about three times as long as wide; with three small simple setae ventrally. Ischium short; 0.3 times as long as wide; with one ventral simple seta. Merus 1.6 times as long as wide; with two simple setae ventrally; one distal spine dorsally. Carpus shorter than merus; about as long as wide; with one simple seta and three spines ventrally; one distal spine and two unequal simple setae dorsally. Propodus 2.7 times as long as wide; with two small (one mid, one subdistal) spines ventrally; one penicillate, one subdistal serrated, and one subdistal simple seta dorsally. Dactylus and unguis similar to those of pereopod 5, but thick and longer.

Pleopods absent.

Uropod (Fig. 2J) short; peduncle about 1.3 times as long as wide; with strong inner apophysis and two unequal outer simple setae subdistally. Exopod with two articles; first article 1.6 times longer than second; with one simple seta; second article with two long unequal terminal setae. Endopod with three articles; article 1 longest, with one distal simple seta; article 2 with one distal simple seta; article 3 with three long setae and one penicillate seta terminally.

Redescription of male cheliped (paratype). ***Cheliped*** (Fig. 3B) symmetrical; larger than female cheliped. Basis 1.1 times as long as wide; broad; rounded ventrally; with one mid-ventral simple seta. Exopod absent. Merus subtriangular; about 2.6 times as long as wide; extended ventrally more than half length of carpal margin; with three small simple setae ventrally. Carpus approximately 1.2 times as long as wide; with two distal simple setae ventrally; one distal simple seta dorsally. Propodus about 1.8 times as long as carpus; with large space between fingers; palm with one long outer and one long inner simple seta in gap between fixed finger and dactylus; two small serrated setae near dactylus joint on inner face. Fixed finger thinner, slightly curved; with 11 simple setae around inner and outer margins (three ventral, six outer submarginal in distal third, two inner near claw); tip slightly denticled. Claw small; orange-brown colour. Dactylus thicker than fixed finger; with proximal apophysis and one outer simple seta; three thick inner simple setae near claw; claw stout; bidentate tip (Fig. 3C); orange-brown colour; stronger than that of fixed finger.

Some remarks about juveniles and manca II. Juveniles length 0.9–1.3 mm. Pereopods 1, 2 basis with two dorsal apophyses; pereopod 3 basis with one dorsal apophysis. Pereopods 1–3 propodus with three ventral spines (proximal ones very small); one dorsal spine; one or two outer subdistal spines. Pereopods 4–6 basis without apophyses; propodus with two ventral spines.

Only in one juvenile out of five: pereopod 1 basis with two dorsal apophyses; pereopods 2 and 3 basis with one dorsal apophysis; pereopods 1–3 propodus with four ventral spines, one dorsal spine, and two outer subdistal spines.

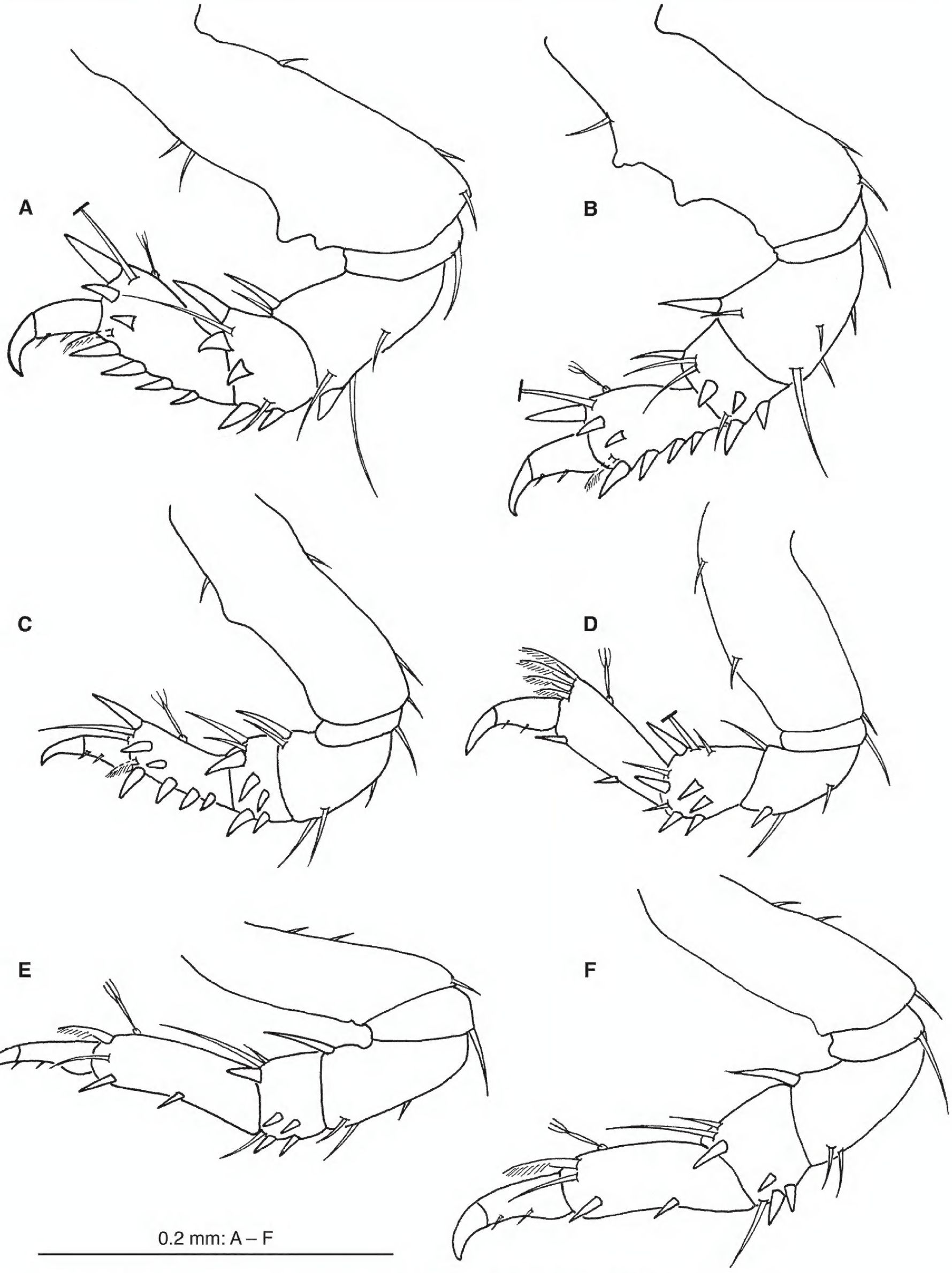

Figure 4. *Synapseudes mediterraneus*, paratype, non-ovigerous female: **A–F.** Pereopods 1–6, outer view.

Manca II length 0.8 mm. Pereopod 1 basis with two dorsal apophyses; pereopods 2, 3 basis with one apophysis; pereopods 1–3 propodus with two ventral spines.

Intraspecific variation. *S. mediterraneus* displays some degree of variation among the individuals examined in this study and from Băcescu (1977) text and drawings: (1) out of 13 males, only one male (7.7%) has asymmetrical chelipeds (left cheliped larger than right one), the rest have symmetrical chelipeds; (2) number of dorsal apophyses of pereopod 1 basis (in males and females) varies between two-three; (3) number of dorsal apophyses of pereopod 2 basis (in males and females) varies between one-three;

Table 2. Some of the relevant systematized morphological characters for the species of the genus *Synapseudes* from Mediterranean Sea.

Characters	*Synapseudes marinae* sp. nov.	*S. mediterraneus* Băcescu, 1977	*S. cystoseirae* Amar & Cazaubon, 1978*	*S. shiinoi* Riggio, 1973*
Manca I body length	0.7–1 mm	–	–	–
Manca II body length	–	0.8 mm	–	–
Juvenile body length	–	0.9–1.3 mm	–	–
Male body length	–	1.5–1.8 mm	–	–
Sex	female	female	?	female
Adult female body length	1.4–2.3 mm	1.3–1.9 mm	2 mm	1.3 mm (young female)
Antennule peduncle articles	4 (articles 2 and 4 are wider than long)	4 (articles 2–4 are wider than long)	4 (articles 2–4 are wider than long)	4 (only article 4 is wider than long)
Antennule inner margin of first peduncular article	with 2 sharp thick and 4 rounded denticles	with 6 sharp small denticles	with many denticles	"quite smooth, lacking a row of denticles" (op.cit.)
Antennule inner flagellum articles	2	2	"trois articles" (op. cit.)	"the flagellum is rudimentary, it consist of a single segment, which is bifid anteriorly" (op. cit.)
Antennule outer flagellum articles	3	3	"trois articles" (op. cit.)	
Antenna flagellum article	2 articles	1	appears like 2 article	1 (rudimentary)
Antenna peduncular article 2 inner margin	with 2 sharp denticles	smooth	?	smooth
Mandibular palp article 3 setae	2 unequal setulate setae	2 unequal setulate setae	2 long setulate setae	about 10 simple setae
Length and width of first pleonite compared to the second pleonite	longer and wider than the second one	slightly longer and wider than the second one	equal in length, but first pleonite wider than the second one	slightly longer and wider than the second one
Dorsal apophyses of pereopod 1 basis	3–4	2–3	2	5?
Dorsal apophyses of pereopod 2 basis	1–3	1–2, rarely 3	2	?
Dorsal apophyses of pereopod 3 basis	1–3	1	2	?
Outer subdistal spines of pereopod 1 propodus	2	2	1	1
Outer subdistal spines of pereopods 2, 3 propodus	2	2	1	?
Ventral spines and setae of pereopod 1 propodus	3, rarely 4 spines and one simple seta	4 spines	3 spines	4 spines
Ventral spines of pereopod 2 propodus	3, rarely 4	4	3	?
Ventral spines of pereopod 3 propodus	3, very rarely 4	4	3	?
Ventral spines of pereopods 4–6 propodus	2	2	1 spine on pereopod 4, only	1 spine on pereopod 4, only
Ventral spines of pereopod 4 carpus	6	4	5	6?
Ventral spines of pereopod 5 carpus	2	4	no spines	?
Ventral spines of pereopod 6 carpus	1	3	no spines	no spines

*For the species *S. cystoseirae* and *S. shiinoi*, the material was not analyzed, the data were taken from the description and images (Amar and Cazaubon 1978; Riggio 1977).

(4) out of five juveniles, four (80%) have the pereopods 1–3 propodus with three ventral spines, only one (20%) with pereopods 1–3 propodus with four ventral spines.

All the adult females and males individuals (100%) have the left and right pereopods 1–3 propodus with four ventral spines.

Size-distribution. Manca II body length 0.8 mm (n = 1). Juveniles body length 0.9–1.3 mm (n = 5). Non-ovigerous females body length 1.3–1.6 mm (n = 4). Female with oostegites body length 1.4 mm (n = 1). Females with empty marsupium body length 1.4–1.5 mm (n = 2). Males body length 1.5–1.8 mm (n = 13).

Distribution and habitat. According to Băcescu (1977): Mediterranean waters of Israel: Ras-El-Nacura (in algae); Acre (in *Pterocladia* algae); Bat Yam (subtidal sandstone platform, in *Jania* algae).

Synapseudes marinae Bâlcu, sp. nov.

https://zoobank.org/63B7F11E-FDE8-47FE-9DF7-BE13ED463AA4

Figs 1, 5–10, Tables 1–3

Material examined. ***Holotype*** • 1 ovigerous female with four eggs in marsupium, length about 1.6 mm (No. 250671). ***Paratypes*** • 1 female with oostegites, length about 1.8 mm (No. 250672); 1 female with empty marsupium, destroyed for DNA sequencing; 1 non-ovigerous female, dissected (permanent slide); from Greece, Sea of Crete, north of Crete Island, Bay of Malia, Milatos Beach, 35°19.22'N, 25°34.37'E, depth 0.4–0.5 m; from algae on rocks, rocky bottom; 23 October 2023; leg. Dr. Oana Paula Popa and Dr. Andrei Ștefan.

Topotypes • 7 females (3 females with oostegites, 2 ovigerous females, 1 non-ovigerous female, 1 female with empty marsupium) and 2 manca I (No. 250673): 3 females destroyed (1 with oostegites, dissected, temporary slide; 1 with oostegites; 1 ovigerous for DNA sequencing); same collection data as holotype and paratypes; 18 June 2024; leg. Maxim-Jean Bâlcu, Dr. Oana Paula Popa and Dr. Andrei Ștefan.

Other material. • 5 females (2 females with oostegites, 2 females with empty marsupium, 1 ovigerous) and 12 manca I (No. 250674): 1 manca I and 1 female with oostegites dissected for SEM analyses; 2 females with empty marsupium destroyed for DNA sequencing; from Greece, Sea of Crete, north of Crete Island, Bay of Malia, 35°19.54'N, 25°34.94'E, depth 0.5 m; from algae on rocks, rocky bottom; 18 June 2024; leg. Maxim-Jean Bâlcu • 2 females (1 female with oostegites, 1 female with empty marsupium) and 2 manca I (No. 250675): 1 female with empty marsupium used for SEM analyses; from Greece, Sea of Crete, north of Crete Island, near Xepapadeas Beach, 35°20.22'N, 25°44.96'E, depth 0.3–0.5 m; from algae on rocks, rocky bottom; 18 June 2024; leg. Maxim-Jean Bâlcu • 3 females (1 ovigerous female, 1 female with oostegites, 1 female with empty marsupium) and 11 manca I (No. 250676): 1 female with oostegites dissected for SEM analyses; 1 manca I destroyed for DNA sequencing; from Greece, Sea of Crete, north of Crete Island, near Xepapadeas Beach, 35°20.27'N, 25°44.94'E, depth 0.3–0.5 m; from algae on rocks, rocky bottom; 18 June 2024; leg. Maxim-Jean Bâlcu • 2 ovigerous females and 9 manca I (No. 250677): 1 manca I destroyed for DNA sequencing; from Greece, Mediterranean Sea, south of Crete Island, 35°1.2'N, 26°4.63'E, depth 0.5 m; from algae on rocks, sandy-rocky bottom; 19 June 2024; leg. Maxim-Jean Bâlcu • 1 ovigerous female and 3 manca I (No. 250678): 1 manca I destroyed for DNA sequencing; from Greece, Sea of Crete, Kalydon Island, 35°15.56'N, 25°45.27'E, depth 0.5 m; from algae on rocks, rocky bottom; 20 June 2024; leg. Maxim-Jean Bâlcu.

Type locality. Greece, Sea of Crete, north of Crete Island, Bay of Malia, Milatos Beach, 35°19.22'N, 25°34.37'E.

Diagnosis. Adult females body length 1.4–2.3 mm. Rostrum long and wide at base; anterior margin concave and rugose; with rows of scales. Pereonites 1–6 with one seta (apparently plumose) on each anterolateral corner. Pereonites 1–3 with one very small simple seta on each posterolateral corner. Pereonites 4–6 with three, two, and one setae, respectively, on each posterolateral corner. Pereonite 3 longest. Each pereonite much wider than long; rounded laterally. Pleonite 1 longer and wider than second. Pleotelson with mid row of 10 long apparently plumose setae and two small simple setae dorsally; one long apparently plumose and one small simple seta posterolaterally; two apparently plumose setae on apex caudo-dorsally. Antennule peduncle with four articles; articles 2 and 4 wider than long; first article longer than remaining articles combined; inner margin with two sharp thick and four rounded denticles. Inner flagellum with two articles; second article with three simple setae and one penicillate seta terminally. Outer flagellum with three articles; last article with four long simple setae and one penicillate seta terminally. Antenna peduncle with four articles; flagellum biarticulate, small, with four long thick setulate setae terminally. Maxilliped first palp article with one simple seta on inner side and one long thick bipinnate spine in outer distal corner. Article 2 largest; with six simple and four setulate setae on inner margin; one long thick bipinnate setiform spine on outer distal corner. Pereopod 1 basis with three or four dorsal apophyses; pereopods 2, 3 basis with one to three dorsal apophyses. Pereopod 1 propodus with three (rarely four) spines and one simple seta ventrally. Pereopods 2, 3 propodus with three (rarely four) spines. Pereopods 4–6 carpus with six, two, and one ventral spines, respectively. Pereopods 4–6 propodus with two small ventral spines.

Description of non-ovigerous female (dissected paratype). ***Body*** (Figs 5A, 7A, B) short, relatively cylindrical, 4.8 times as long as wide; length about 1.5 mm.

Cephalothorax (Figs 5A, 7A, B) (including rostrum) approximately 25% of body length, about 1.3 times as long as wide. Rostrum (Figs 5B, 8D) long and wide at base, with anterior margin concave and rugose, and with rows of scales. Ocular lobes undefined; visual elements with dark pigment; one very small simple seta present under eyes. Carapace with two pairs of mid-dorsal simple setae, one medial simple seta on lateral sides, and two very small posterodorsal simple setae.

Pereon (Figs 5A, 7A, B) approximately 61% of body length, about 2.4 times as long as carapace length; each pereonite much wider than long and rounded laterally. Pereonite 3 longest, about 0.6 times as long as wide. All pereonites with one seta (apparently plumose) on each anterolateral corner. Pereonites 1–3 with three pairs of dorsal setae, the longest ones apparently plumose, and one very small simple seta on each posterolateral corner. Pere-

onite 4 with four pairs of dorsal setae, the longest ones apparently plumose; one apparently plumose seta and two very small simple setae on each posterolateral corner. Pereonites 5 and 6 with five pairs of dorsal setae, the longest ones apparently plumose; two simple setae and one simple seta, respectively, on each posterolateral corner.

Pleon (Figs 5A, 7A, B) approximately 14% of body length, consisting of two free pleonites and pleotelson. Pleonite 1 longer and wider than second, with one apparently plumose seta laterally and a row of nine apparently plumose setae dorsally. Pleonite 2 with a row of eight apparently plumose setae dorsally. Each pleonite expanded posterolaterally into a small spiniform process.

Pleotelson (Figs 5A, 7A, B) about 1.6 times as long as combined length of pleonites, somewhat triangular; with acute apex in dorsal view, and crest-like in lateral view (Fig. 5C), with a row of 10 long apparently plumose setae and two small simple setae dorsally; one long apparently plumose seta and one small simple seta posterolaterally; two apparently plumose setae on apex, caudo-dorsally.

Antennule (Figs 5D, 8A, B). Peduncle with four articles; first article longest, about 1.6 times as long as wide; inner margin with six denticles (two mid-sharp thick and four rounded), two simple setae and some scales distally; outer margin with two penicillate, two long simple setae, and one setulate seta; four penicillate setae on ventral surface, subterminally; two penicillate and about three small setae on dorsal surface. Articles 2 and 4 wider than long. Article 2 about 0.4 times as long as article 1, with inner and outer distal dentiform prolongations; two small simple setae on inner margin, and three setulate setae and one simple seta on outer margin distally; five penicillate setae on ventral surface, terminally. Article 3 much narrower and about 0.9 times as long as article 2, with one simple and one setulate seta on inner margin and one simple seta on outer margin distally. Article 4 (common) 0.5 times as long as article 3, with two simple setae inner distally and a small notch for insertion of outer flagellum with one penicillate seta. Inner flagellum with two articles; first article with one simple and one penicillate seta inner distally; second article with two long thick simple setae, one small simple seta, and one penicillate seta terminally. Outer flagellum slightly longer than inner one, with three articles; first article with one aesthetasc and two simple setae on inner distal corner, two simple setae on outer corner; article 2 with two long simple setae and one aesthetasc; article 3 with four long simple setae and one penicillate seta terminally.

In ventral view, common article 4 appears to consist of two parts and the peduncle of only three articles; outer flagellum with four articles; inner flagellum with three articles (Fig. 8B).

Antenna (Figs 5E, 8C) (without terminal setae) smaller than first peduncular article of antennule. Peduncle with four articles. First article wider than long, with an inner dentiform expansion bearing many hairs and some rows of scales. Articles 2 and 3 wider than long. Article 2 about 0.5 times as long as article 1, with rows of scales, two sharp denticles, and one small simple seta on inner margin, and one small simple seta on outer distal corner. Article 3 shortest, about 0.7 times as long as article 2; outer and inner margins slightly denticled, with one small simple seta on inner distal corner. Article 4 longer than articles 2 or 3, with inner and outer distal dentiform prolongations; one mid-inner and five terminal penicillate setae; one long setulate seta, subterminally. Flagellum biarticulate, small; first article naked; second article minute, with four long thick setulate setae, terminally. Squama absent.

Labrum (Figs 5F, 8G) with many long setulae and with a conical projection, anteriorly directed.

Mandibles (Figs 5G, H, 8H–K) with three-articled palp; article 1 about 2.7 times as long as wide, naked; article 2 about 2.5 times as long as wide, naked; article 3 smallest, with two unequal setulate setae, terminally. Pars molaris without distinctive features. Pars incisiva of left mandible (Figs 5G, 8H, I) wide, without conspicuous denticles; lacinia mobilis with four rounded denticles; setiferous lobe with three finely serrated setae. Pars incisiva of right mandible (Figs 5H, 8J, K) wide, without conspicuous denticles; setiferous lobe with three finely serrated setae and one stout furcate seta.

Labium (Figs 5I, 8L) with numerous setulae along outer margin of basal lobe and rostral area, on anterior part. Palp narrow, ovate, with numerous setulae on outer margin and two small fine spines, terminally.

Maxillule (Figs 5J, 8M, N) with biarticled palp ending in two long unequal setulate setae. Outer endite with 10 narrow spines (two denticled), terminally; one small simple seta, subterminally; and numerous setulae on outer margin (Fig. 5J). Inner margin with small sharp denticles; inner endite with four terminal setulate setae and numerous setulae on outer margin (Fig. 5J).

Maxilla (Fig. 5K) with outer lobe of movable endite bearing six long simple setae distally; outer margin with setulae. Inner lobe of movable endite with about six setae. Outer lobe of fixed endite with three simple setae, two stout furcate setae, and three serrated setae. Inner lobe of fixed endite with a row of eight setae (thicker at base), followed distally by two robust bipinnate setae; inner margin with small denticles.

Maxilliped (Figs 5L, 8E) with basis 1.1 times as long as wide, naked. First palp article short and broad, with one simple seta on inner side and one long, thick bipinnate spine on outer distal corner. Article 2 largest, narrower proximally, with six simple and four setulate setae on inner margin; one long, thick bipinnate setiform spine on outer distal corner. Article 3 smaller than article 2, with four stout serrated setae and five finely serrated setae on inner margin. Article 4 smaller than previous articles, with three serrated setae subterminally; seven unequal serrated setae and one small simple seta on inner side. Endite (Figs 5M, 8F) with one long simple seta and seven setulate truncate setae, and many hairs on rostral side; one curved simple seta subterminally. Inner margin with five circumplumose setae and two coupling hooks; outer margin with hairs.

Epignath (Fig. 5N) narrow, curved; margins with many hairs; one long distal spine, longer than half the length of epignath.

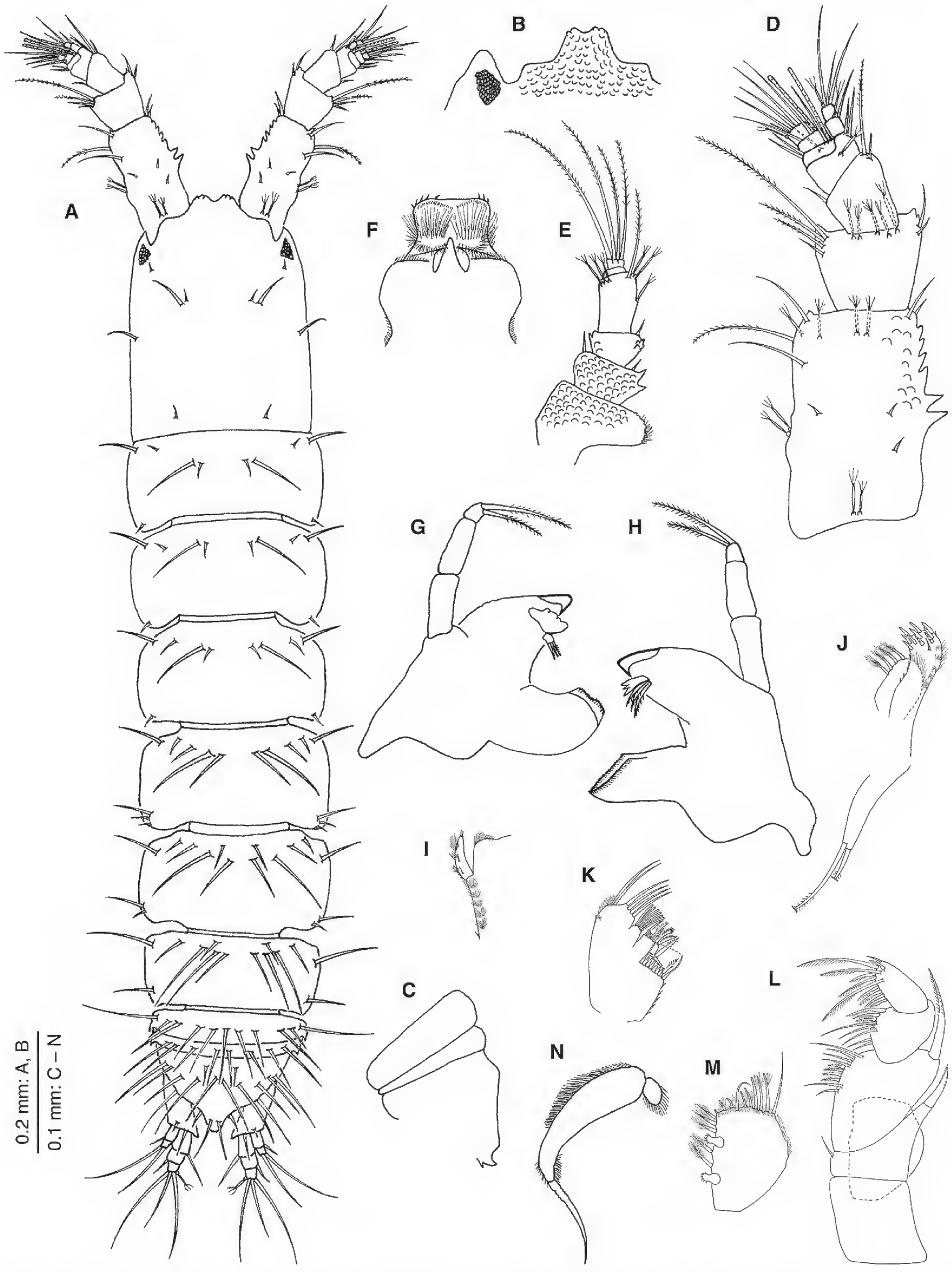

Figure 5. *Synapseudes marinae* sp. nov., paratype, non-ovigerous female: **A.** Body, dorsally; **B.** Rostrum, detail; **C.** Pleon and pleotelson, laterally; **D.** Antennule; **E.** Antenna; **F.** Labrum; **G.** Left mandible; **H.** Right mandible; **I.** Labium; **J.** Maxillule; **K.** Maxilla; **L.** Maxilliped; **M.** Maxilliped endite; **N.** Epignath.

Cheliped (Figs 6A, 9A). Basis about 1.4 times as long as wide, broad, oval ventrally, with one mid and one distal simple seta, ventrally; dorsal margin with some scales. Exopod absent. Merus subtriangular, 3.7 times as long as wide, extended ventrally about half length of carpal margin; two very small proximal and two distal simple setae, ventrally. Carpus two times as long as wide, with two distal simple setae, ventrally; one distal simple seta, dorsally. Propodus as long as

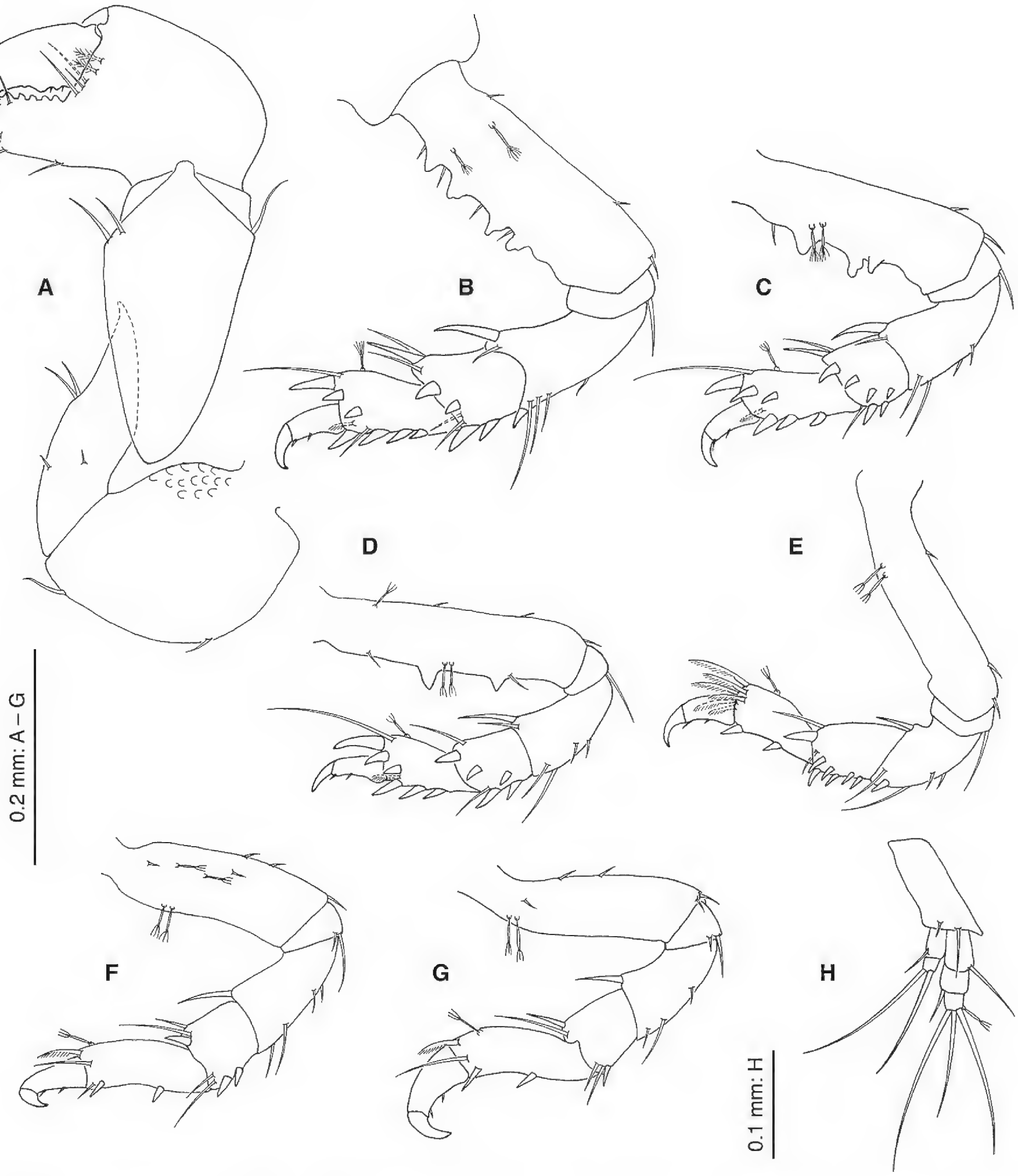

Figure 6. *Synapseudes marinae* sp. nov., paratype, non-ovigerous female: **A.** Cheliped, outer view; **B–G.** Pereopods 1–6, outer view; **H.** Uropod.

carpus; palm with one long and one small simple seta on outer face; one long simple seta and two small serrated setae near dactylus joint on inner face. Fixed finger thick, with two ventral simple setae, four submarginal simple setae in distal third of fixed finger, and two inner simple setae near claw; cutting edge with about 10 rounded denticles; claw small, orange-brown. Dactylus as wide as fixed finger; cutting edge proximally with two or three rounded denticles; three simple setae near claw on inner face; claw stout, orange-brown, stronger than fixed finger and with bidentate tip.

Pereopod 1 (Figs 6B, 9B, C) largest. Exopod absent. Basis 3.2 times as long as wide; ventral margin with three small simple setae; four apophyses interspersed by four small simple setae dorsally; two penicillate setae on outer face. Ischium very short, 0.3 times as long as wide, with one long ventral simple seta. Merus 1.6 times as long as wide; ventral margin with one small and three long simple setae and one spine; one small simple seta and one robust spine dorsally. Carpus shorter than merus, about as long as wide; two spines and two simple setae ventrally; two outer subdistal spines; one robust spine and two long simple setae dorsally. Propodus 1.8 times as long as wide, with three (Fig. 9B), rarely four (Figs 6B, 9C) spines and one simple seta ventrally; two outer subdistal spines; one penicillate seta, one robust spine and one long simple seta dorsally; one subdistal small inner serrated seta near

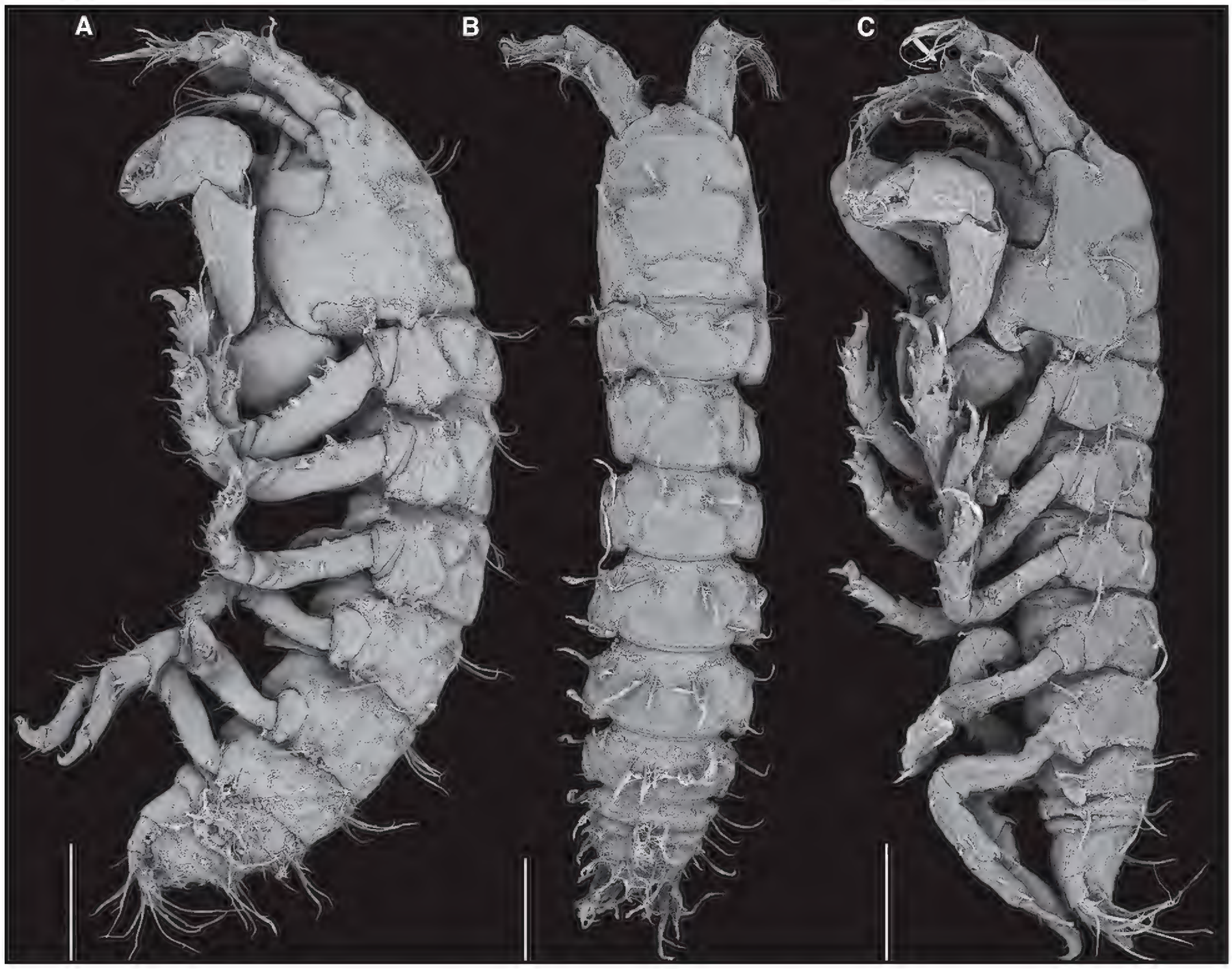

Figure 7. *Synapseudes marinae* sp. nov., topotypes: **A.** Body of a female with oostegites, laterally; **B.** Body of a female with empty marsupium, dorsally; **C.** Manca I, laterally. SEM images by R. M. Motoc. Scale bars: 200 µm (**A, B**); 100 µm (**C**).

dactylus articulation, ventrally. Dactylus with two small ventral setae; unguis short and curved.

Pereopod 2 (Figs 6C, 9D). Basis 3.4 times as long as wide; ventral margin with two small distal simple setae; three mid-apophyses, one small simple seta and two penicillate setae, dorsally. Ischium very short, 0.3 times as long as wide, with one ventral simple seta. Merus 1.6 times as long as wide; ventral margin with two small and two long simple setae; one small simple seta and one robust spine, dorsally. Carpus shorter than merus, about as long as wide; one simple seta and four spines, ventrally; two outer subdistal spines; one long simple seta and one slender spine, dorsally. Propodus about 2.3 times as long as wide; three ventral spines (increasing in size distally); two outer subdistal spines; one penicillate seta, one robust spine and one long simple seta, dorsally; one subdistal small inner serrated seta near dactylus articulation, ventrally. Dactylus and unguis similar to that of pereopod 1, but smaller.

Pereopod 3 (Figs 6D, 9E) smaller than pereopod 2. Basis 4.1 times as long as wide; ventral margin with three small simple setae and one proximal penicillate seta; two mid-apophyses, two small simple and two penicillate setae, dorsally. Ischium short, 0.4 times as long as wide, with one long ventral simple seta. Merus 1.7 times as long as wide; ventral margin with four simple setae; one slender spine and one simple seta, dorsally. Carpus shorter than merus, 1.3 times as long as wide; three spines and one simple seta, ventrally; two outer subdistal spines; one distal simple seta, dorsally. Propodus 1.7 times as long as wide; three ventral spines (increasing in size distally); two outer subdistal spines; one penicillate seta, one very long simple seta and one robust spine, dorsally; one subdistal small inner serrated seta near dactylus articulation, ventrally. Dactylus and unguis similar to that of pereopod 2, but smaller.

Pereopod 4 (Figs 6E, 9F). Basis 4.6 times as long as wide; three small simple setae, ventrally; two penicillate setae, dorsally. Ischium very short, 0.2 times as long as wide, with one long simple seta, ventrally. Merus 1.2 times as long as wide; four simple setae and one subdistal small spine, ventrally; one slender spine, dorsally. Carpus slightly shorter than merus, 1.5 times as long as wide; six spines (in three pairs) and one simple seta, ventrally; one subdistal small seta; one robust spine and one simple seta, dorsally. Propodus slightly longer than merus or carpus, about two times as long as wide; two small (one mid and one subdistal) spines, ventrally; one penicillate seta and three inner and three outer serrated setae, dorsally. Dactylus slightly curved, with two small ventral setae; unguis short and curved.

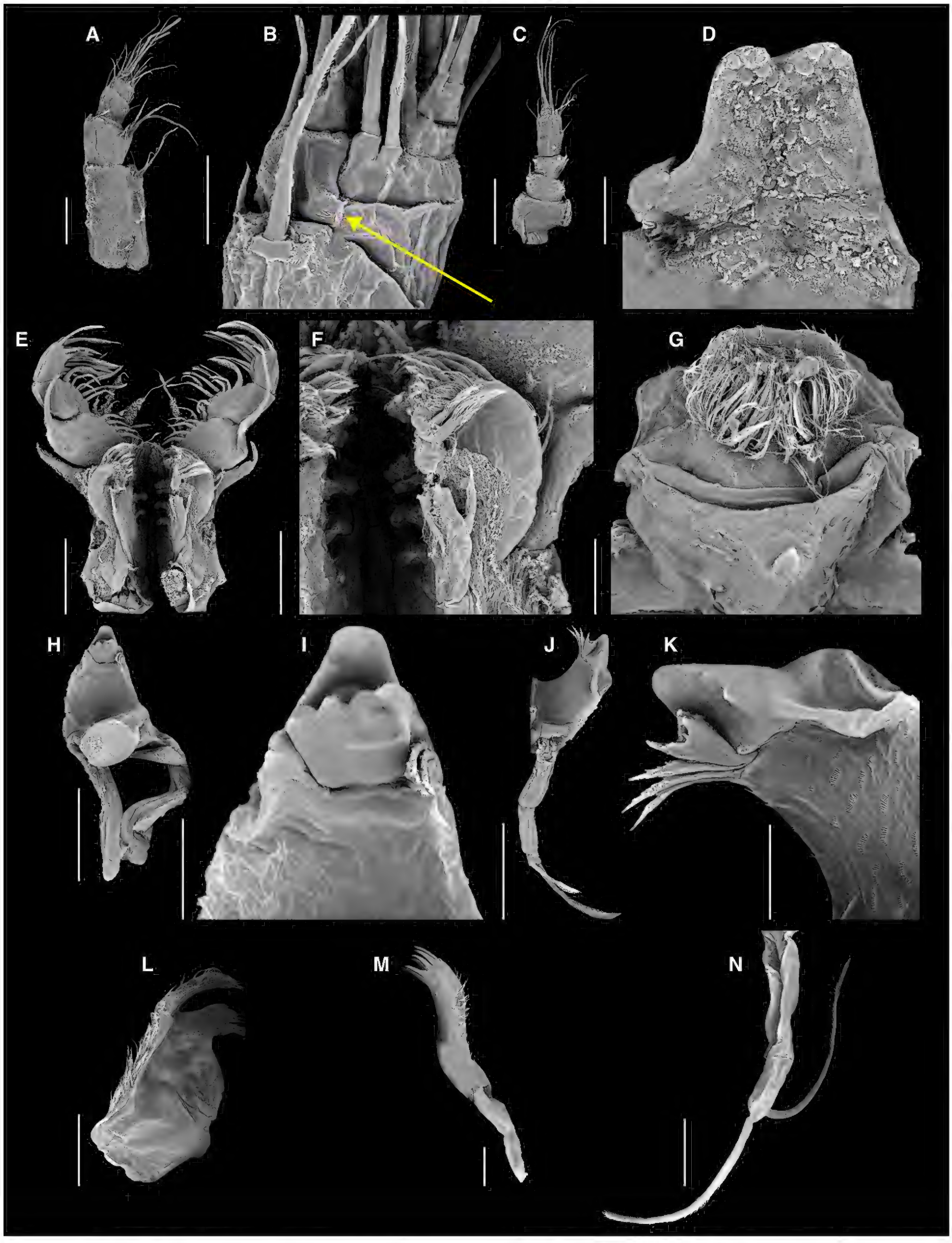

Figure 8. *Synapseudes marinae* sp. nov., topotype, female with oostegites: **A.** Antennule, dorsally; **B.** Antennule article 4 and inner and outer flagella, detail, ventrally, (the arrow indicates the apparent demarcation line of article 4); **C.** Antenna, dorsally; **D.** Rostrum, dorsally; **E.** Maxilliped and endite; **F.** Maxilliped endite; **G.** Labrum; **H.** Left mandible; **I.** Pars incisiva, lacinia mobilis, and setiferous lobe of left mandible; **J.** Right mandible; **K.** Pars incisiva and setiferous lobe of right mandible; **L.** Labium; **M, N.** Maxillule outer endite and palp. SEM images by R. M. Motoc. Scale bars: 80 µm (**A, C, E, H, J**); 30 µm (**D, G, F, L, M, N**); 20 µm (**B**, **I**, **K**).

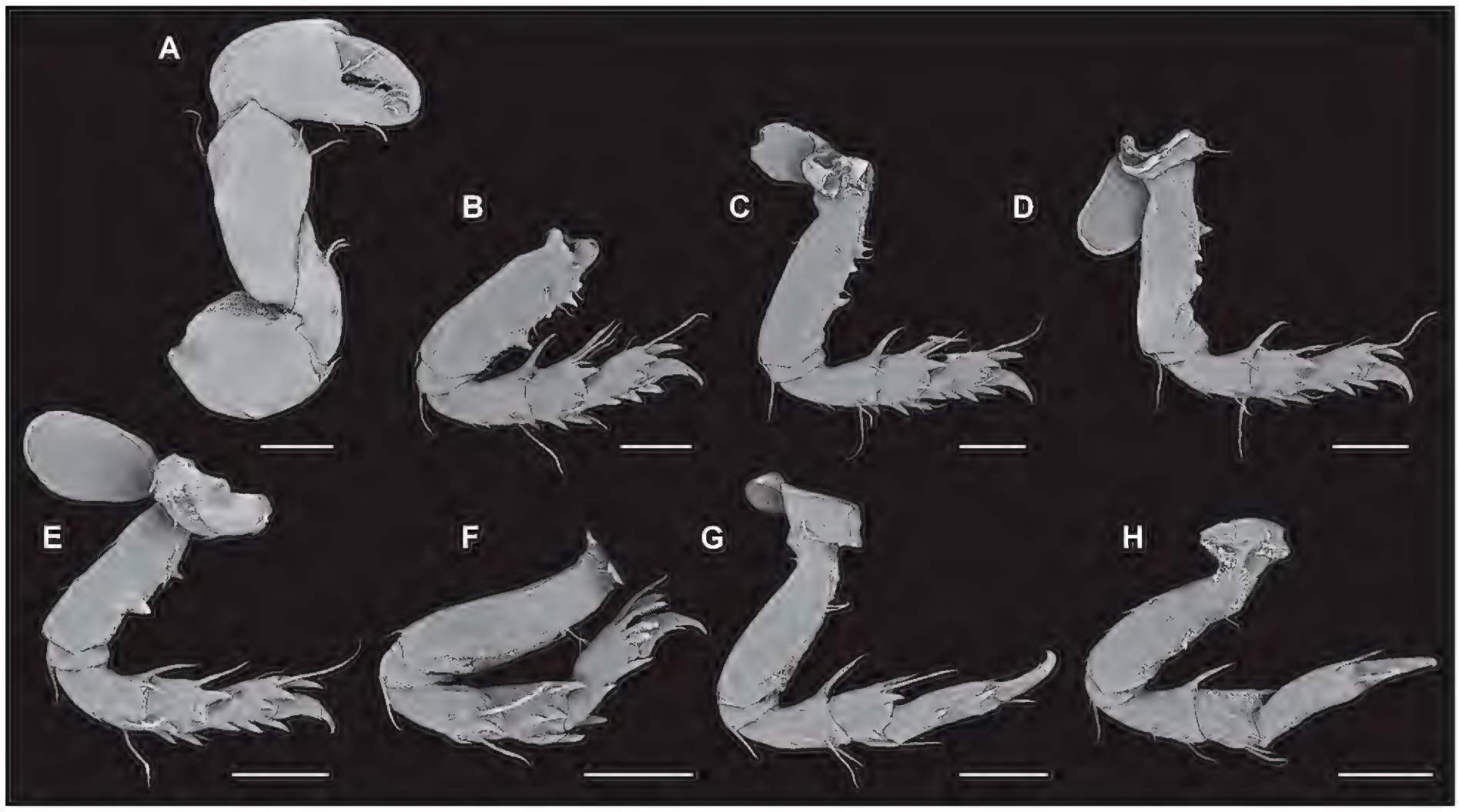

Figure 9. *Synapseudes marinae* sp. nov., topotype, female with oostegites: **A.** Cheliped, outer view; **B.** Pereopod 1, right, outer view; **C.** Pereopod 1, left, outer view; **D–H.** Pereopods 2–6, outer view. SEM images by R. M. Motoc. Scale bars: 100 μm (**A–H**).

Pereopod 5 (Figs 6F, 9G). Basis 3.2 times as long as wide; three small simple setae, ventrally; two penicillate and two small simple setae on the outer face; two penicillate setae, dorsally. Ischium short, 0.4 times as long as wide, with two simple setae, ventrally. Merus 1.6 times as long as wide; four simple setae, ventrally; one distal robust spine, dorsally. Carpus shorter than merus, about as long as wide; two spines and two simple setae, ventrally; one spine and two simple setae, dorsally. Propodus 2.6 times as long as wide; two small (one mid, one subdistal) spines and one simple seta, ventrally; one outer simple seta; one penicillate and one serrated seta, dorsally. Dactylus and unguis as in pereopod 4.

Pereopod 6 (Figs 6G, 9H). Basis 3.7 times as long as wide; four small simple setae, ventrally; one small simple seta on the outer face; two penicillate setae, dorsally. Ischium short, 0.5 times as long as wide, with two simple setae, ventrally. Merus 1.5 times as long as wide; three simple setae, ventrally; one distal spine, dorsally. Carpus shorter than merus, 1.1 times as long as wide; two simple setae and one small spine, ventrally; one slender spine and one long simple seta, dorsally. Propodus 2.8 times as long as wide; two small (one mid, one subdistal) spines, ventrally; one outer simple seta; one penicillate and one serrated seta, dorsally. Dactylus thick, with two small ventral setae; unguis robust and curved.

Pleopods absent.

Uropod (Fig. 6H) short, peduncle 2.1 times as long as wide, with an inner apophysis and two unequal simple setae outer distally. Exopod with two articles; first article 2.5 times longer than second, with one simple seta; second article with two long unequal simple setae, terminally. Endopod with three articles; first article largest, with one distal simple seta; second article with one distal small simple seta; third article with three long simple setae and one penicillate seta, terminally.

Male. Unknown.

Some remarks about manca I. Body (Fig. 7C) length 0.7–1.0 mm. Pereopods 1–3 propodus always with two ventral spines (n = 39).

Etymology. Dedicated to Marina Hărățu, the mother of the first author, in gratitude for her unwavering efforts, patience, and support in all aspects of his life.

Intraspecific variation. *S. marinae* sp. nov. displays some degree of variation among the 23 females examined in this study: (1) number of dorsal apophyses of pereopod 1 basis varies between three-four; (2) number of dorsal apophyses of pereopods 2, 3 basis varies between one-three; (3) out of 23 adult females, 17 adult females (74%) have the left and right pereopods 1–3 propodus with three spines and one simple seta, ventrally, and six adult females (26%) have the left and right pereopods 1–3 propodus with three-four spines and one simple seta, ventrally.

Size-distribution. Manca I body length ranged from 0.7 to 1.0 mm (n = 39). Non-ovigerous females body length ranged from 1.5 to 2.1 mm (n = 2). Females with oostegites body length ranged from 1.6 to 2.2 mm (n = 7). Ovigerous females body length ranged from 1.4 to 1.78 mm (n = 6). Females with empty marsupium body length ranged from 1.7 to 2.3 mm (n = 4).

Distribution and habitat. Crete Island (Sea of Crete and Mediterranean Sea), Greece; from algae on the rocks (*Jania* sp., *Liagora* sp., *Cladophora* sp., *Corallina* sp.), rocky bottom (Fig. 1).

Remarks. The new species distinguished from the other Mediterranean *Synapseudes* species by the following characters: (1) the length and shape of the rostrum: long and wide at the base, with anterior margin concave and rugose, and with rows of scales; (2) a much higher number and disposition of dorsal setae on the cephalothorax, pereon, pleon and pleotelson; (3) the number and the disposition of anterior and posterior lateral setae on the pereon, pleon and pleotelson; (4) pereonite 3 longest; (5) the length of the pleonites: pleonite 1 longer and wider than the second one; (6) length and width of the articles of the antennule peduncle: articles 2, 4 are wider than long; (7) the number and shape of the denticles on the inner margin of antennule article 1: two sharp thick and four rounded denticles; (8) antenna flagellum: biarticulate; (9) number of dorsal apophyses of pereopods 1–3 basis: three-four, one-three and one-three, respectively; (10) outer subdistal spines of pereopods 1–3 propodus: two spines; (11) ventral spines of pereopods 1–3 propodus: three-four; and (12) ventral spines of pereopods 4–6 carpus: six, two and one, respectively.

Some of the new species diagnostic characters, listed above, are presented in a structured form in Table 2.

Twenty-six percent of analyzed specimens (six adult females out of 23 adult individuals) show variation of three or four ventral spines between left and right pereopods 1–3 propodus of the same individual, but never four ventral spines simultaneously on both left and right pereopods 1–3 propodus, as observed in all adult specimens of *S. mediterraneus*.

Genetic information. A 610 bp fragment of the cytochrome c oxidase subunit I (COI) gene obtained from a specimen of *Synapseudes* sp. nov. (PV748674), representing the first publicly available sequence record for a *Synapseudes* species in GenBank and BOLD Systems.

The sequence contained 235 polymorphic sites, of which 203 were parsimony-informative and 32 singleton variable sites. The best-fitting nucleotide substitution model for the COI dataset: HKY with gamma-distributed rate variation among sites.

To assess genetic divergence, pairwise genetic distances calculated between species within the same genus, providing a comparative framework with other tanaid genera. For example, genetic distances among *Leptochelia* species ranged from 25% to 28%. Intraspecific distances also estimated for well-represented species in BOLD and GenBank (Table 3). Genetic distance observed for *Synapseudes* sp. nov.: 28%.

Table 3. Estimates of Evolutionary Divergence between Sequences. Standard error estimate(s) are shown above the diagonal.

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. *Alokalliapseudes macsweenyi*_HM016213		0.00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
2. *Alokalliapseudes macsweenyi*_HM016212	0.01		0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
3. *Alokalliapseudes macsweenyi*_JF962424	0.01	0.00		0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
4. *Alokalliapseudes macsweenyi*_JF962425	0.01	0.00	0.01		0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
5. *Alokalliapseudes macsweenyi*_HM016211	0.03	0.03	0.03	0.03		0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
6. *Calozodion pabisi*_KP225292	0.32	0.31	0.33	0.33	0.32		0.00	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
7. *Calozodion pabisi*_KP225293	0.32	0.31	0.33	0.33	0.32	0.00		0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
8. *Apseudopsis latreillii*_PMACA078	0.32	0.32	0.33	0.33	0.32	0.32	0.32		0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
9. *Apseudopsis latreillii*_PMACA079	0.39	0.39	0.40	0.41	0.38	0.36	0.36	0.24		0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
10. *Apseudopsis latreillii*_PMACA080	0.36	0.37	0.38	0.37	0.37	0.33	0.33	0.19	0.23		0.02	0.02	0.02	0.02	0.02	0.02	0.02
11. *Apseudes spinosus*_MG935006	0.33	0.33	0.34	0.35	0.33	0.30	0.30	0.31	0.35	0.36		0.00	0.02	0.02	0.02	0.02	0.02
12. *Apseudes spinosus*_MG934922	0.33	0.33	0.34	0.35	0.33	0.30	0.30	0.31	0.35	0.36	0.00		0.02	0.02	0.02	0.02	0.02
13. *Leptochelia longichelipes*_HM016201	0.40	0.39	0.41	0.41	0.39	0.43	0.43	0.45	0.46	0.44	0.39	0.39		0.02	0.02	0.02	0.02
14. *Leptochelia dubia*_HM016215	0.39	0.38	0.40	0.40	0.39	0.42	0.42	0.45	0.47	0.45	0.38	0.38	0.29		0.02	0.02	0.02
15. *Leptochelia forresti*_HM016206	0.35	0.34	0.36	0.36	0.35	0.41	0.41	0.41	0.45	0.44	0.37	0.37	0.25	0.27		0.02	0.02
16. *Synapseudes*_sp_DD2010_HM016207	0.36	0.34	0.37	0.37	0.35	0.34	0.34	0.35	0.40	0.36	0.34	0.34	0.41	0.38	0.41		0.02
17. ***Synapseudes_marinae*_sp. nov.**	0.32	0.32	0.33	0.33	0.32	0.31	0.31	0.33	0.37	0.35	0.34	0.34	0.39	0.39	0.37	**0.28**	

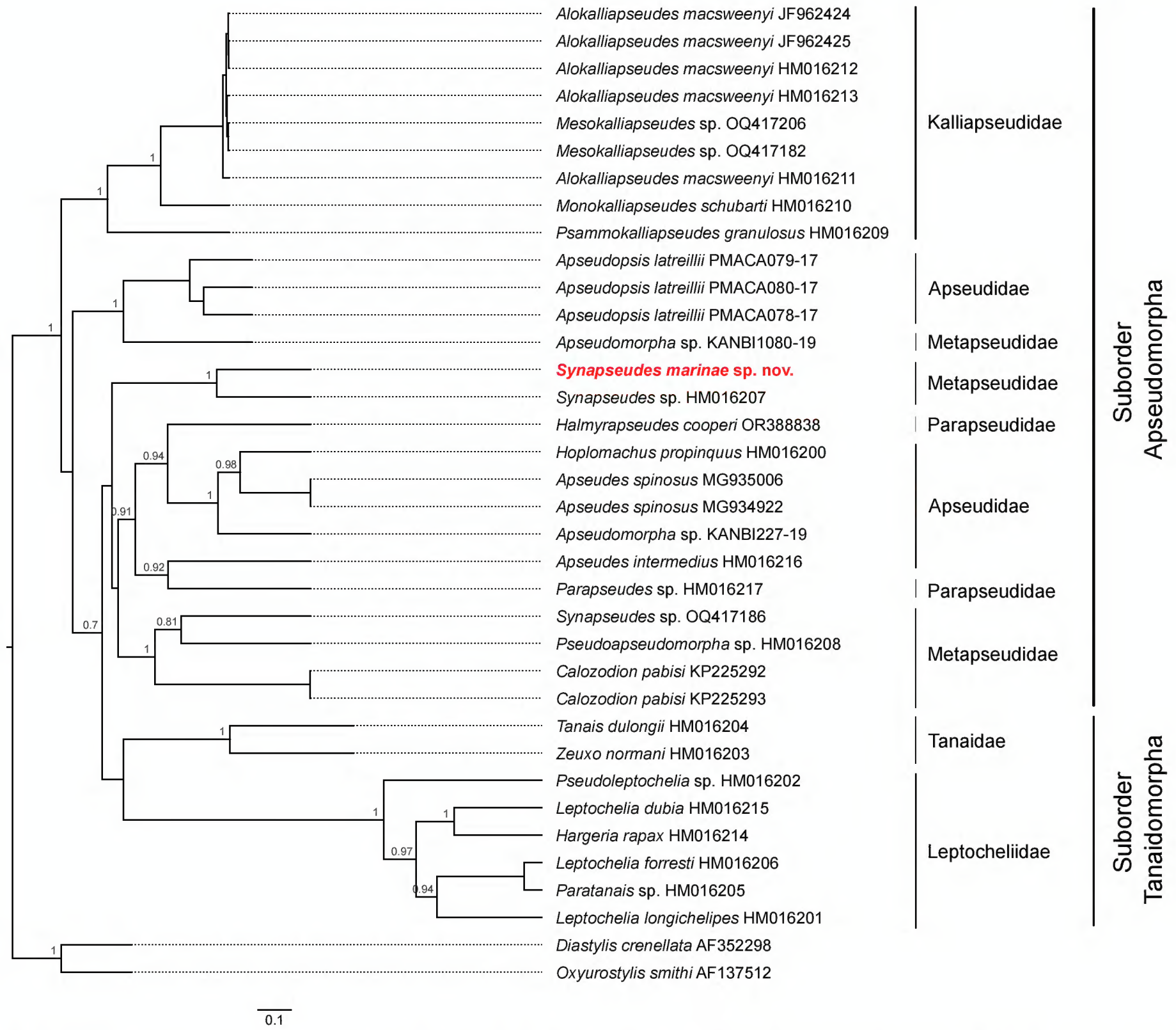

Figure 10. Phylogenetic relationships of Tanaidacea reconstructed with the BI method. The nodes show the Bayesian posterior probabilities and the bootstrap percentage. For the support values of the nodes, BI ≥ 0.70 are shown.

The Bayesian inference phylogenetic tree (Fig. 10) confirmed that *Synapseudes marinae* sp. nov. belongs to Metapseudidae, clustering with another *Synapseudes* species. However, Metapseudidae, represented by the three genera *Synapseudes*, *Calozodion*, and *Pseudoapseudomorpha*, recovered as polyphyletic.

Our analysis further revealed that Tanaidomorpha is not monophyletic, with Tanaidacea and Leptocheliidae nested within some Apseudomorpha taxa (Apseudidae, Metapseudidae, Parapseudidae), consistent with Drumm (2010). In contrast, monophyly of Kalliapseudidae strongly supported in this phylogeny and previous studies (Drumm and Heard 2011). Broader taxon sampling and inclusion of additional molecular markers needed to further test this hypothesis and generate a more robust phylogeny.

Remarks

In both species (*S. mediterraneus*, *S. marinae* sp. nov.), the penicillate setae show a different conformation from the "usual" type (i.e. what appear to be typical penicillate setae, or at least as they have been observed, described, illustrated, and interpreted so far). In the present material, the rachis bears a few setulae only at its terminal portion, rather than along both sides.

Synapseudes mediterraneus

Examination of the material from the collections of the "Grigore Antipa" National Museum (holotype, allotype, and paratypes):

- confirms the statement of Heard et al. (2018) regarding the structures that Băcescu (1977: fig. 2C) considered to be possible vestiges of pleopods. These actually represent the lateral spines of the reduced pleura associated with pleonites 1–2, as illustrated by Heard et al. (2018: fig. 4H). These are lateral spiniform processes of the pleonites, marked by arrows in the dorsal illustrations of the pleon (Băcescu 1977: fig. 2D; Heard et al. 2018: fig. 4G).

- antennule outer flagellum composed of three articles (article 2 very narrow and difficult to detect), not two as drawn and described by Băcescu (op. cit.: fig. 2E).
- antenna flagellum with four terminal simple setae, as in the illustration (op. cit.: fig. 2F), not three as stated in the text.
- pereopod 1 basis with two or three dorsal apophyses.
- pereopods 1–3 always with four ventral spines on propodus in adults; not "3–4-dentated propodus on the ventral edge." Only juveniles possess three ventral spines on the propodus of pereopods 1–3 (op. cit.: 121).

***Synapseudes pinosensis* (Guțu & Ortiz, 2009)**

After examining the material (1 female, paratype No. 250.422) and according to Dr. Guțu (pers. comm.), the antennal peduncle comprises four articles and the flagellum two articles, not as drawn and described (peduncle with only three articles, the flagellum with two articles, antenna described as five-articulate; Guțu and Ortiz 2009: 94, 95, fig. 3D). This earlier interpretation led to the confusion that article 3 is longer than article 4, which was subsequently regarded by Heard et al. (2018: 311) as a potentially unique character of systematic importance for this species: "article-3 of its antenna appears to be more than three times longer than article-4, whereas in all other members of the genus article-4 is significantly longer than article-3." This distinction is no longer supported.

Discussion

In the diagnosis of the genus *Synapseudes* and from the description and illustrations of *S. minutus* Miller, 1940 (the type species), the pleon is "composed of only three segments" (Miller 1940: 311, fig. 6c). In the genus emended diagnosis, Heard et al. (2018) stated: "Pleon with segments appearing functionally fused; but with vestiges of one to three pleonites delineated by sutures, at least dorsally," and in the redescription of the type species, the pleon consists of three pleonites marked by circular sutures and a pleotelson (Heard et al. 2018: 311, 313, fig. 5A, B).

All four species from the Mediterranean Sea (*S. shiinoi*, *S. mediterraneus*, *S. cystoseirae*, and *S. marinae* sp. nov.) have the pleon composed of two free pleonites and a pleotelson – exactly as in the case of the monotypic genus *Synapseudoides* Guţu & Ortiz, 2009 from the north of the Caribbean Sea (south of Cuba). This leads to the conclusion that *Synapseudoides* could be a valid genus. Furthermore, there are many species with the pleon consisting of two or three free pleonites (this being an obvious character) and a pleotelson included in the same genus, *Synapseudes*.

Out of the 28 *Synapseudes* species known so far (*S. marinae* sp. nov. included), 14 species have the pleon composed of two pleonites and a pleotelson. For the remaining four species (*S. hancocki* Menzies, 1953; *S. heterocheles* (Vanhöffen, 1914); *S. isis* Segadilha, Siqueira & Iwasa-Arai, 2021; and *S. makkaveevae* Băcescu, 1976), the number of pleonites varies between one and three. This highlights the need for division into several genera. Unfortunately, the number of pleonites alone is not sufficient; this requires a very detailed analysis of the descriptions, redescriptions, and available material to establish additional differentiating or shared characters between species in order to group them meaningfully into genera.

With *S. marinae* sp. nov., the number of *Synapseudes* species from the Mediterranean Sea rises to four, and the total number of species in the genus becomes 28.

Acknowledgments

The authors would like to thank Dr. Modest Guțu for his permanent support and guidance, and Felix Vîjiac for digitizing the plates. The authors also wish to thank the two reviewers for their thorough and helpful comments and suggestions that substantially improved the manuscript.

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